

What is the interpretation of a ROC curve and can you provide examples?

Authored by
stats writer

May 5, 2024

RECOMMENDED CITATION

stats writer (2024). *What is the interpretation of a ROC curve and can you provide examples?*. PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=142910>

A ROC (Receiver Operating Characteristic) curve is a graphical representation of the performance of a binary classification model. It plots the true positive rate (sensitivity) against the false positive rate (1-specificity) at various threshold values. The closer the curve is to the upper left corner of the plot, the better the model's performance. The area under the ROC curve (AUC) is a measure of the model's overall accuracy and a higher AUC indicates a better model.

For example, in medical diagnosis, a ROC curve can be used to evaluate the performance of a diagnostic test by plotting the true positive rate (proportion of correctly identified disease cases) against the false positive rate (proportion of incorrectly identified healthy cases). A higher AUC would indicate that the test is better at correctly identifying disease cases.

In the field of machine learning, a ROC curve can be used to evaluate the performance of a binary classification algorithm, such as logistic regression or support vector machines. The AUC can be used to compare and select the best performing algorithm for a given dataset.

In summary, a ROC curve is a useful tool for evaluating the performance of binary classification models and can be applied in various fields, including medicine and machine learning.

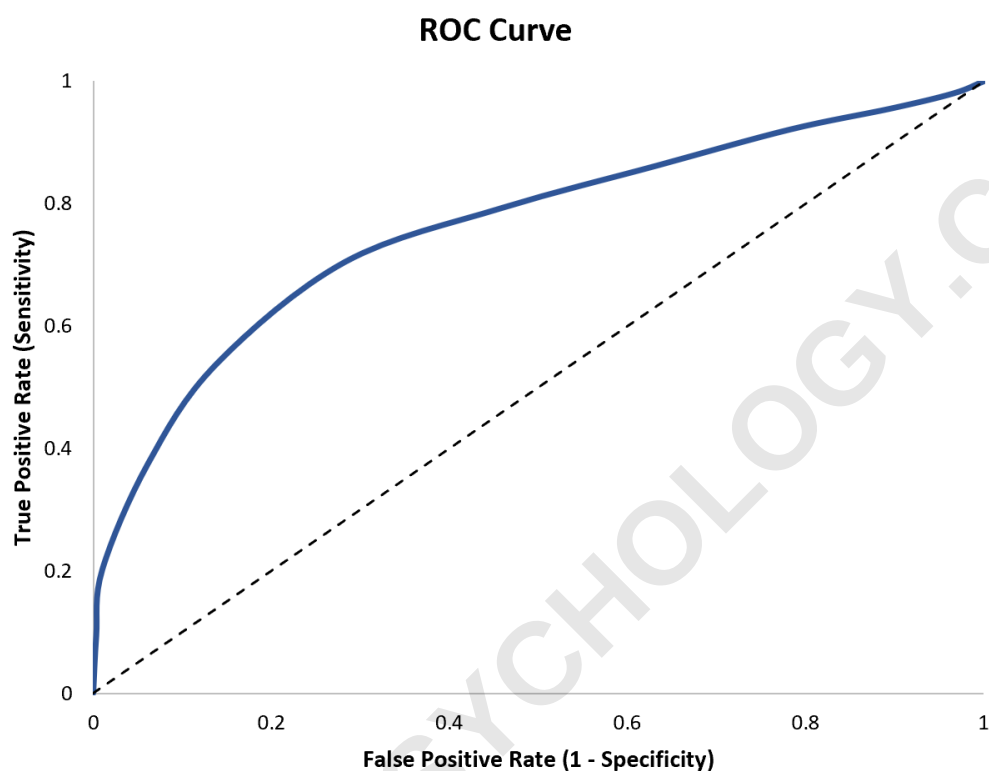
Interpret a ROC Curve (With Examples)

Logistic Regression is a statistical method that we use to fit a regression model when the response variable is binary. To assess how well a logistic regression model fits a dataset, we can look at the following two metrics:

Sensitivity: The probability that the model predicts a positive outcome for an observation when the outcome is indeed positive.
Specificity: The probability that the model predicts a negative outcome for an observation when the outcome is indeed negative.

An easy way to visualize these two metrics is by

creating a ROC curve, which is a plot that displays the sensitivity and specificity of a logistic regression model.



This tutorial explains how to create and interpret a ROC curve.

How to Create a ROC Curve

Once we've fit a logistic regression model, we can use the model to classify into one of two categories.

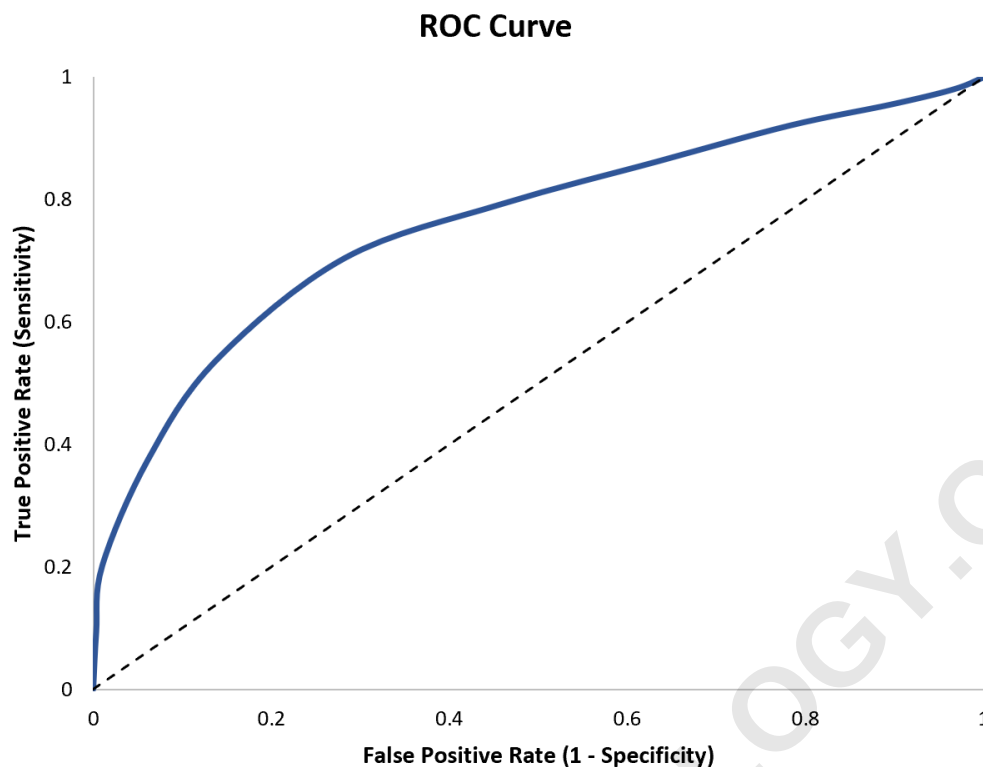
For example, we might classify observations as either

"positive" or "negative."

The true positive rate represents the proportion of observations that are predicted to be positive when indeed they are positive.

Conversely, the false positive rate represents the proportion of observations that are predicted to be positive when they're actually negative.

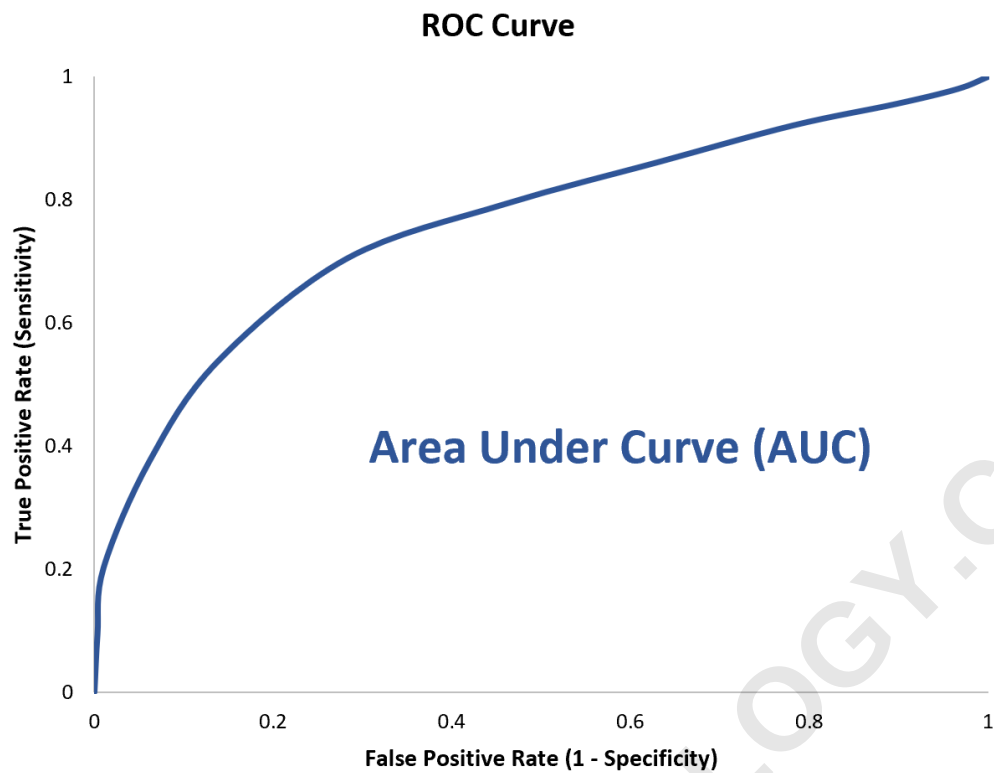
When we create a ROC curve, we plot pairs of the true positive rate vs. the false positive rate for every possible decision threshold of a logistic regression model.



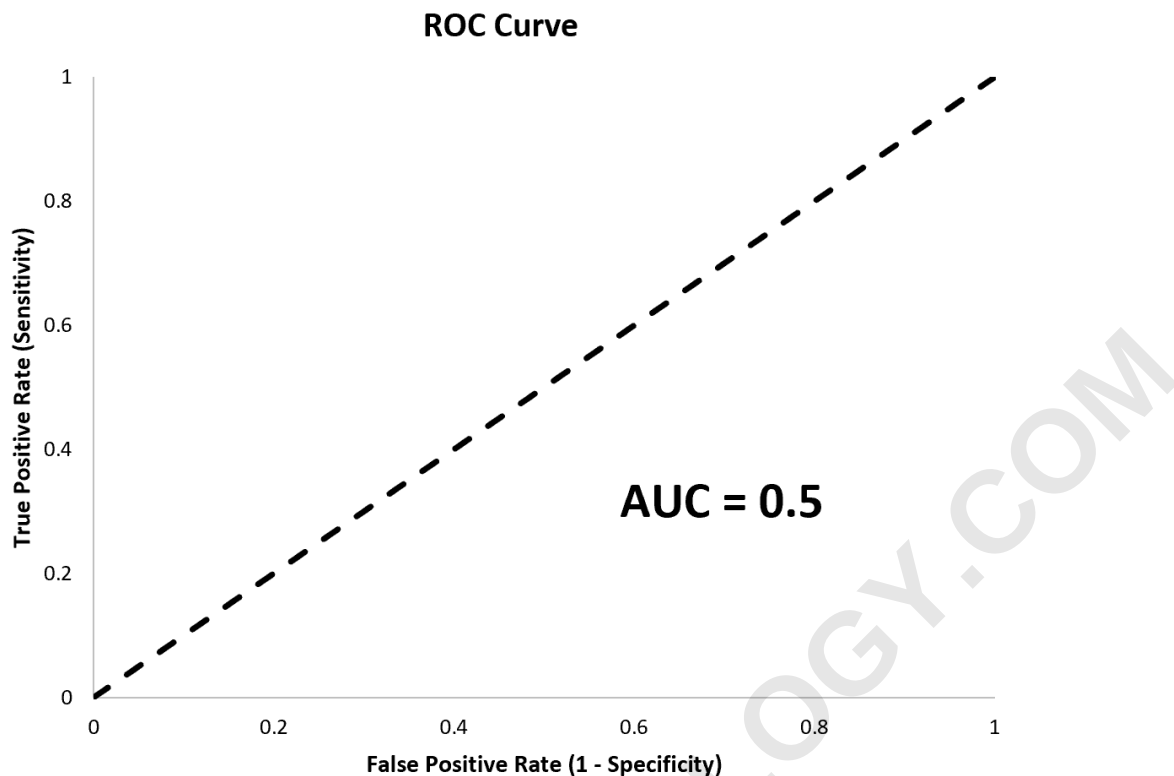
How to Interpret a ROC Curve

The more that the ROC curve hugs the top left corner of the plot, the better the model does at classifying the data into categories.

To quantify this, we can calculate the AUC (area under the curve) which tells us how much of the plot is located under the curve.

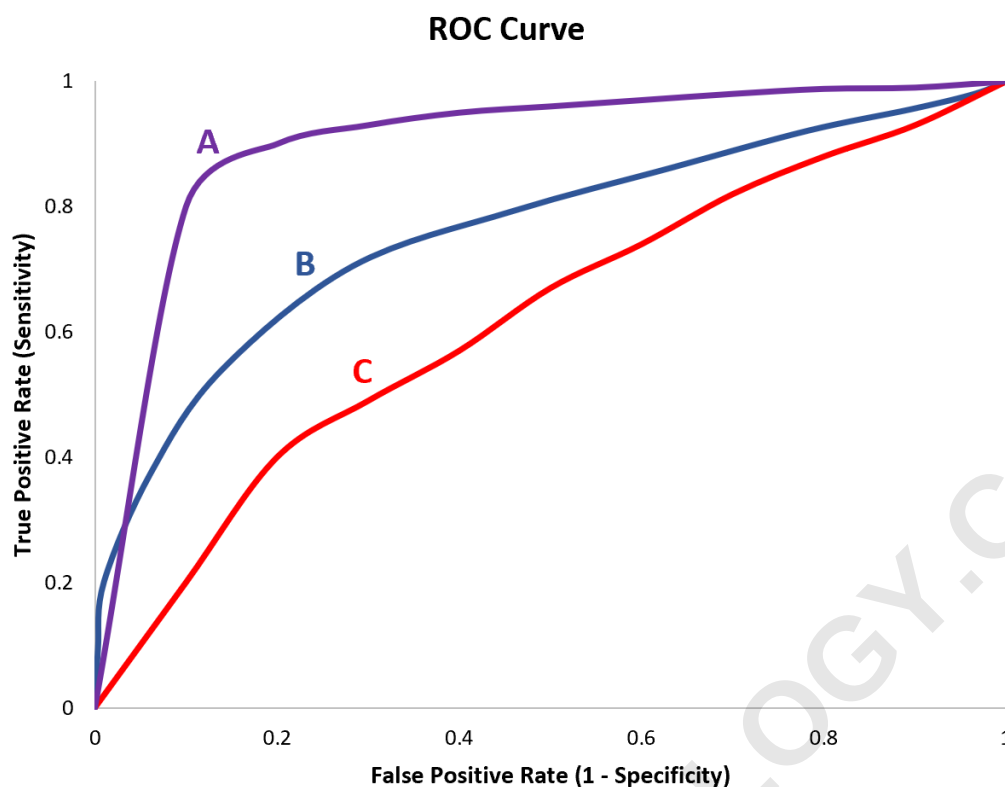


The closer AUC is to 1, the better the model.



It's particularly useful to calculate the AUC for multiple logistic regression models because it allows us to see which model is best at making predictions.

For example, suppose we fit three different logistic regression models and plot the following ROC curves for each model:



Suppose we calculate the AUC for each model as follows:

Model A: AUC = 0.923
Model B: AUC = 0.794
Model C: AUC = 0.588

Model A has the highest AUC, which indicates that it has the highest area under the curve and is the best model at correctly classifying observations into categories.

The following tutorials explain how to create ROC

curves using different statistical software:

ARABPSYCHOLOGY.COM